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CHRISTIE, PARKER & HALE, LLP
PO BOX 7068
PASADENA, CA 91109-7068

EXAMINER	
TORRES, JUAN A	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/989,367	AGAZZI, OSCAR E.	
	Examiner	Art Unit	
	Juan A. Torres	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-46,49 and 50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-46,49 and 50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Response to Arguments

Applicant's arguments with respect to claim1-46 and 49-50 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 37, 38, 40 and 41 are rejected under 35 U.S.C. 102(b) as being anticipated by Agarossi ("An effective Non Linear Receiver for high density optical disk", IEEE Global Telecommunications Conference, 1998. GLOBECOM 98. The Bridge to Global Integration. IEEE Volume 6, 8-12 Nov. 1998 Page(s): 3374 - 3378 vol.6).

As per claims 37 and 40, Agarossi discloses receiving a signal including linear and non linear components (pages 3375-3376 sections 3 and 3.1); estimating, in a non linear channel estimator, the expected values of the received signal (pages 3375-3376 sections 3 and 3.1); computing the branch metrics based on the expected values of the received signal (pages 3375-3376 sections 3 and 3.1); providing the computed branch metrics to a Viterbi decoder (pages 3376-3377 section 3.2); and Viterbi decoding the

received signal using the branch metrics provided to the Viterbi decoder (pages 3376-3377 section 3.2).

As per claims 38 and 41, Agarossi discloses providing the value of the received signal to a Volterra kernel estimator (abstract; figure 1; and pages 3375-3376 sections 3- 3.2); and computing the expected value sent based on the output of the Volterra kernel estimator (abstract; figure 1; and pages 3375-3376 sections 3- 3.2).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sands ("Non-linear identification on the digital magnetic recording channel", Twenty-Fifth Asilomar Conference on Signals, Systems and Computers, 4-6 Nov. 1991 Page(s):6 - 10 vol.1), in view of Sakaguchi (US 4747094)

As per claim 1, Sands discloses a method for modeling the behavior of a data channel the method comprising determining a sequence of data input to the data channel (figure 1 x_k pages 6-7 section 2.1); using at least part of the sequence of data input to the data channel as an index to a channel model value (figure 1 x_k pages 6-7 section 2.1); sampling the data after it has passed through the channel to produce a sampled value (figure 1 y_k pages 6-7 section 2.1); comparing the channel model value with the sampled value (figure 1 y_k - $\hat{y}_k$ pages 6-7 section 2.1); and adjusting the

channel model value based on the results of the comparison between the channel model value and the sampled value (page 9 section 2.6). Sands doesn't specifically disclose the use of the method for a optical fiber channel. Sakaguchi discloses optical filber channels (abstract and column 3 lines 47-64). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 1.

As per claim 2, Sands and Sakaguchi disclose claim 1. Sands also discloses determining a sequence of data input to the data channel comprises determining the last N bits input to the channel (figure 1 x_k pages 6-7 section 2.1). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 2.

As per claim 3, Sands and Sakaguchi disclose claim 2. Sands inherently discloses where N=5 (pages 6-7 section 2.1). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 3.

As per claim 4, Sands and Sakaguchi disclose claim 1. Sands discloses that the sampling of the data after it has passed through the channel to produce a sampled value comprises producing a real number representing the sampled value ($y_{k,i}$ pages 6-7 section 2.1). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 4.

As per claim 5, Sands and Sakaguchi disclose claim 1. Sands discloses adjusting the channel model value further comprises adjusting the channel model value according to an LMS (Least Means Squared) algorithm (page 9 section 2.6). Sands and

Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 5.

As per claim 6, Sands and Sakaguchi disclose claim 1. Sands discloses adjusting the channel model value further comprises adjusting the channel model value until it converges (page 9 section 2.6). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 6.

As per claim 7, Sands and Sakaguchi disclose claim 6. Sands discloses comprising converting the look up table into Volterra Kernels (pages 6-7 section 2.1). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so

would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 7.

As per claim 8, Sands and Sakaguchi disclose claim 7. Sands discloses converting the look up table into Volterra Kernels using a Hadamard transform (page 7 section 2.2). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 8.

As per claim 9, Sands and Sakaguchi disclose claim 7. Sands discloses adjusting the Volterra Kernels based on the results of the comparison between the channel model value and the sampled value (page 9 section 2.6). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 9.

As per claim 10, Sands and Sakaguchi disclose claim 9. Sands discloses eliminating the insignificant Volterra Kernels (pages 7-8 section 2.4). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 10.

As per claim 11 Sands discloses a method for modeling the behavior of a data channel the method comprising determining a sequence of data input to the data channel (figure 1 x_k pages 6-7 section 2.1); determining a Volterra Series representation of the channel (figure 1 pages 6-7 section 2.1); accepting at least part of the sequence of data input to the data channel into the Volterra series representation of the channel to produce a channel model value (figure 1 pages 6-7 section 2.1); sampling the data after it has passed through the channel to produce a sampled value (figure 1 y_k pages 6-7 section 2.1); comparing the channel model value with the sampled value (figure 1 y_k - $\hat{y}_k$ pages 6-7 section 2.1); and adjusting the channel model value based on the results of the comparison between the channel model value with the sampled value (page 9 section 2.6). Sands doesn't specifically disclose the use of the method for a optical fiber channel. Sakaguchi discloses optical filber channels (abstract and column 3 lines 47-64). Sands and Sakaguchi Sands are analogous art because they are from the same

field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 11.

As per claim 12 Sands discloses accepting a most recent value of the sequence of data input to the data channel (x_k pages 6-7 section 2.1); accepting the most recent value of the sequence of data input to the data channel into a first FIR (Finite Impulse Response) filter (page 9 section 3); accepting a product of the most recent value of the sequence of data input to the data channel and a second most recent value of the sequence of data input to the data channel into a second FIR (page 9 section 3); and summing an output of the first FIR and output of the second FIR to form the channel model value (page 9 sections 2.6 and 3). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 12.

As per claim 13 Sands discloses accepting a most recent value of the sequence of data input to the data channel (x_k pages 6-7 section 2.1); accepting the most recent

value of the sequence of data input to the data channel into a first FIR filter (page 9 section 3); accepting a product of the most recent value of the sequence of data input to the data channel and the second most recent value of the sequence of data input to the data channel into a second FIR (page 9 section 3); accepting a product of the most recent value of the sequence of data input to the data channel and a third most recent value of the sequence of data input to the data channel into a third FIR (page 9 section 3); and summing an output of the first FIR and output of the second FIR and output of the third FIR to form the channel model value (page 9 sections 2.6 and 3). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 13.

As per claim 14 Sands discloses accepting a most recent value of the sequence of data input to the data channel (x_k pages 6-7 section 2.1); accepting the most recent value of the sequence of data input to the data channel into a first FIR filter (page 9 section 3); accepting a product of the most recent value of the sequence of data input to the data channel and the second most recent value of the sequence of data input to the data channel into a second FIR (page 9 section 3); accepting a product of the most recent value of the sequence of data input to the data channel and a third most recent

value of the sequence of data input to the data channel into a third FIR (page 9 section 3); accepting a product, the product being the most recent value of the sequence of data input to the data channel and the two next most recent data input, into a fourth FIR (page 9 section 3); and summing an output of the first FIR and output of the second FIR and output of the third FIR and output of the fourth FIR to form the channel model value (page 9 sections 2.6 and 3). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 14.

As per claims 15-18 Sands discloses the difference between the channel model value and the output of the channel is used to update all the FIRs (page 9 section 2.6). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claims 15-18.

As per claims 19-22 Sands discloses that an LMS algorithm is used to update all the FIRs (page 9 section 2.6). Sands and Sakaguchi Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate nonlinear estimator disclosed by Sands in the optical fiber channel disclosed by Sakaguchi. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sands and Sakaguchi to obtain the invention as specified in claim 19-22.

Claims 39 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarossi ("An effective Non Linear Receiver for high density optical disk", IEEE Global Telecommunications Conference, 1998. GLOBECOM 98. The Bridge to Global Integration, IEEE Volume 6, 8-12 Nov. 1998 Page(s): 3374 - 3378 vol.6) in view of Sands ("Non-linear identification on the digital magnetic recording channel", Twenty-Fifth Asilomar Conference on Signals, Systems and Computers, 4-6 Nov. 1991 Page(s):6 - 10 vol.1). Agarossi discloses claims 37 and 40. Agarossi doesn't discloses providing the value of the received signal as an address to a look up table; and looking up the stored value as the actual value transmitted. Sands discloses providing the value of the received signal as an address to a look up table (pages 6-8; abstract and section 2.4); and looking up the stored value as the actual value transmitted (pages 6-8; abstract and section 2.4). Agarossi and Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the optical channel receiver

disclosed by Sakaguchi nonlinear estimator disclosed by Sands. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Agarossi and Sands to obtain the invention as specified in claims 39 and 42.

Claims 43, 44, 46, and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaguchi (US 4747094) in view of Agarossi ("An effective Non Linear Receiver for high density optical disk", IEEE Global Telecommunications Conference, 1998. GLOBECOM 98. The Bridge to Global Integration. IEEE Volume 6, 8-12 Nov. 1998 Page(s):3374 - 3378 vol.6).

As per claims 43 and 46 Sakaguchi discloses a method for detecting digital data modulated on an optical signal and received over an optical channel, the method comprising converting the optical signal to an electrical signal (figure 1 column 4 lines 25-58); converting the electrical signal to a multibit digital representation (column 9 lines 24-25, the signal is a digital signal); estimating distortion introduced in the optical signal by the optical channel (figure 1 column 4 lines 25-58). Sakaguchi doesn't specifically disclose compensating the multibit digital representation for the distortion; and detecting the digital data from the compensated multibit digital representation. Agarossi discloses converting the electrical signal to a multibit digital representation (page 3377 section 4); estimating distortion introduced in the optical signal by the optical channel (figure 1 pages 3374-3375 section 2.1; pages 3375-3376 section 3.1); compensating the multibit digital representation for the distortion (figure 1 pages 3376-3377 section 3.2); and detecting the digital data from the compensated multibit digital representation (figure 1

pages 3376-3377 section 3.2). Sakaguchi and Agarossi are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Agarossi. The suggestion/motivation for doing so would have been to reduce the nonlinear ISI (Agarossi abstract). Therefore, it would have been obvious to combine Sakaguchi with Agarossi to obtain the invention as specified in claims 43 and 46.

As per claims 44 and 49, Sakaguchi and Agarossi disclose claims 43 and 46. Agarossi also discloses estimating in a Volterra Kernel estimator the distortion introduced in the optical channel (figure 1 pages 3376-3377 section 3.2). Sakaguchi and Agarossi are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Agarossi. The suggestion/motivation for doing so would have been to reduce the nonlinear ISI (Agarossi abstract). Therefore, it would have been obvious to combine Sakaguchi with Agarossi to obtain the invention as specified in claims 44 and 49.

Claims 23-36, 45 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaguchi (US 4747094) in view of Agarossi ("An effective Non Linear Receiver for high density optical disk", IEEE Global Telecommunications Conference, 1998. GLOBECOM 98. The Bridge to Global Integration. IEEE Volume 6, 8-12 Nov. 1998 Page(s):3374 - 3378 vol.6), and further in view of Sands ("Non-linear

identification on the digital magnetic recording channel", Twenty-Fifth Asilomar Conference on Signals, Systems and Computers, 4-6 Nov. 1991 Page(s):6 - 10 vol.1).

As per claim 23 and 30 Sakaguchi discloses converting the optical signal into an electrical signal (figure 1 column 4 lines 25-58). Sakaguchi doesn't specifically disclose summing the electrical signal with a correction signal; providing the summed signal to a detector; detecting the summed signal to produce decisions; providing the decisions to a nonlinear channel estimator; and estimating the correction signal in the nonlinear channel estimator. Agarossi discloses an equalizer summing the electrical signal with a correction signal (abstract; figure 1 page 3376 section 3.2); providing the summed signal to a detector (figure 1 Viterbi detector pages 3376-3377 section 3.2); detecting the summed signal to produce decisions (figure 1 $\hat{a}_n$ pages 3376-3377 section 3.2). Sakaguchi and Agarossi are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Agarossi. The suggestion/motivation for doing so would have been to reduce the nonlinear ISI (Agarossi abstract). Sands disclose providing the decisions to a nonlinear channel estimator (figure 1 x_k pages 6-7 section 2.1); estimating the correction signal in the nonlinear channel estimator (figure 1 y_k - $\hat{y}_k$ pages 6-8 section 2.1 and 2.5); and adapting the estimating in the nonlinear channel estimator in accordance with the decisions (page 9 section 2.6). Sakaguchi and Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to

incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Sands. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sakaguchi with Agarossi and Sands to obtain the invention as specified in claims 23 and 30.

As per claims 24 and 31 Sands discloses accepting the decisions (figure 1 x_k pages 6-7 section 2.1); predicting the inter-symbol interference of the channel in a nonlinear channel estimator (figure 1 y_k - $\hat{y}_k$ pages 6-8 sections 1 Introduction, 2.1 and 2.5); and forming a correction signal from the predicted inter-symbol interference (figure 1 y_k - $\hat{y}_k$ pages 6-8 sections 1 Introduction, 2.1 and 2.5). Sakaguchi and Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Sands. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sakaguchi with Agarossi and Sands to obtain the invention as specified in claims 24 and 31.

As per claims 25 and 32 Sands discloses providing the decisions to a plurality of Volterra Kernels (page 7 section 2.2); and summing the output of the plurality Volterra Kernels to form a correction signal (page 7 section 2.2). Sakaguchi and Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to

incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Sands. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sakaguchi with Agarossi and Sands to obtain the invention as specified in claims 25 and 32.

As per claims 26 and 33 Sands discloses comparing the predicted inter-symbol interference to inter-symbol interference in the electrical signal (pages 8-9 section 2.5); and updating the Volterra Kernels based on the result (page 9 section 2.6). Sakaguchi and Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Sands. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sakaguchi with Agarossi and Sands to obtain the invention as specified in claims 26 and 33.

As per claims 27 and 34 Sands discloses using a LMS (Least Means Squared) algorithm to update the Volterra Kernels (page 9 section 2.6). Sakaguchi and Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Sands. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been

obvious to combine Sakaguchi with Agarossi and Sands to obtain the invention as specified in claims 27 and 34.

As per claims 28 and 35 Sands discloses providing the data decisions as an address into a look up table (abstract); outputting a value stored in the look up table as the predicted inter-symbol interference (pages 7-8 section 2.4); comparing the predicted inter-symbol interference to the inter-symbol interference in the electrical signal (pages 8-9 section 2.5); and updating the value stored in the look up table based on the result (page 9 section 2.6). Sakaguchi and Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Sands. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sakaguchi with Agarossi and Sands to obtain the invention as specified in claims 28 and 35.

As per claims 29 and 36 Sands discloses using a LMS (Least Means Squared) algorithm (page 9 section 2.6). Sakaguchi and Sands are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Sands. The suggestion/motivation for doing so would have been to minimize the means-squared error (Sands abstract). Therefore, it would have been obvious to combine Sakaguchi with Agarossi and Sands to obtain the invention as specified in claims 29 and 36.

As per claims 45 and 50, Sakaguchi and Agarossi disclose claims 43 and 46. Sakaguchi and Agarossi don't disclose estimating in a lookup table estimator the distortion introduced in the optical channel. Sands discloses estimating in a lookup table estimator the distortion introduced in the optical channel (abstract and pages 7-8 section 2.4). Sakaguchi and Agarossi are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the optical channel receiver disclosed by Sakaguchi nonlinear estimator disclosed by Agarossi. The suggestion/motivation for doing so would have been to reduce the nonlinear ISI (Agarossi abstract). Therefore, it would have been obvious to combine Sakaguchi with Agarossi to obtain the invention as specified in claims 45 and 50.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Agarossi (US 6600794 B1) discloses a method and device for nonlinear maximum likelihood sequence estimation by removing non-linear inter-symbol-interference (ISI) from a received signal similar to the reference used in the art rejection of the present Office action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

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Juan Alberto Torres
12-05-2005

KEVIN BURD
PRIMARY EXAMINER